PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-170326

(43)Date of publication of application : 14.06.2002

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(51)Int.Cl. G11B 20/10
G10L 19/00

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(54) DATA GENERATING METHOD, DATA REPRODUCING DEVICE AND DATA RECORDER

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a data generating method, a data recording and reproducing device, by which the data other than compressed can be generated together with the compressed data at the time of recording data.

SOLUTION: When the data is recorded, the compressed data subjected to data compression by a data compression circuit 6a is recorded on a disk 13, and a differential signal to be a difference between data subjected again to data expansion by a data expansion circuit 6b and the original data delayed by a delay circuit 14 is also outputted to the data recording and reproducing device of a post stage. The data recording and reproducing device of the post stage records the compressed data of the differential signal on another disk 13.

LEGAL STATUS [Date of request for examination] 07.02.2003
[Date of sending the examiner's decision of rejection]
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]
[Date of final disposal for application]
[Patent number] 3833063
[Date of registration] 28.07.2006
[Number of appeal against examiner's decision of rejection]
[Date of requesting appeal against examiner's decision of rejection]
[Date of extinction of right]

2.**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] the difference showing the difference of the compressed data which carried out the data compression of the 1st data according to the predetermined lossy compression method, and the expanding data which carried out data decompression of this compressed data according to said lossy compression method and the original input data -- data -- generating -- said compressed data and said difference -- the data generation method characterized by generating the 2nd data which compounded data.

[Claim 2] said difference -- the data generation method according to claim 1 characterized by data being the compressed data by which the data compression was carried out.

[Claim 3] said difference -- the data generation method according to claim 2 characterized by being the compressed data by which the data compression was carried out by the lossy compression method as the compression method

for generating compressed data with the data more nearly same than said 1st data.

[Claim 4] said difference -- the data generation method according to claim 2 characterized by data being the compressed data by which the data compression was carried out by the lossless compression method.

[Claim 5] the difference generated from said 1st data -- the difference generated in order [data], after carrying out the data compression of the data the expanding data which carried out data decompression again, and the original difference -- the difference showing difference with data -- the difference which generates data -- data generation actuation -- n (n) The compressed data generated from zero or more integer time repeats and said 1st data, the difference generated from said 1st data -- data and said difference -- n difference which repeated data generation actuation n times and was generated -- the data generation method according to claim 1 characterized by compounding data and generating the 2nd data.

[Claim 6] said difference -- the data generation method according to claim 5 characterized by being the compressed data by which the data compression was carried out by the lossy compression method as the compression method

for generating compressed data with the data more nearly same than said 1st data.

[Claim 7] said n-th difference -- the difference generated in data generation actuation -- the data generation method according to claim 5 or 6 characterized by data being the compressed data by which the data compression was carried out by the lossless compression method.

[Claim 8] The 2nd data generated with the data generation method according to claim 1 to 4 is inputted. this 2nd data -- said difference -- the expanding data which carried out data decompression of the compressed data which separated data and the compressed data generated from said 1st data, and was generated from said 1st data -- said difference -- by adding the difference obtained from data The data regenerative apparatus characterized by generating said 1st data and reproducing.

[Claim 9] The 2nd data generated with the data generation method according to claim 2 to 4 is inputted. Data and the compressed data generated from said 1st data are separated. this 2nd data -- said difference -- the expanding data which carried out data decompression of the compressed data generated from said 1st data -- said difference -- the data regenerative apparatus characterized by

generating said 1st data and reproducing by adding the difference obtained by carrying out data decompression of the data.

[Claim 10] The 2nd data generated with the data generation method according to claim 5 to 7 is inputted. Data and the compressed data generated from said 1st data are separated. this 2nd data -- said difference -- the expanding data which carried out data decompression of the compressed data generated from said 1st data -- said n difference -- the data regenerative apparatus characterized by generating said 1st data and reproducing by adding the difference obtained from data.

[Claim 11] The 2nd data generated with the data generation method of a publication is inputted into either claim 6 or claim 7. Data and the compressed data generated from said 1st data are separated. this 2nd data -- said difference -- the expanding data which carried out data decompression of the compressed data generated from said 1st data -- said n difference -- the data regenerative apparatus characterized by generating said 1st data and reproducing by adding the difference obtained by carrying out data decompression of the data.

[Claim 12] the difference contained in said 2nd data when the transmission rate of said 2nd data inputted becomes high -- the data regenerative apparatus

according to claim 10 or 11 characterized by the quantity of data increasing.

[Claim 13] the compressed data generated from said 1st data, and said n difference -- said compressed data obtained by data being stored in the record medium of another object, respectively, and these all record media being reproduced, and said n difference -- the data regenerative apparatus according to claim 10 or 11 characterized by reproducing said 1st data with data.

[Claim 14] The read-out control section which reads the compressed data stored in the record medium, and the data decompression section which carries out data decompression of the compressed data read by the read-out control section by the predetermined lossy compression method, Data are inputted from the exterior. the difference to which the former data of said compressed data stored in said record medium and said compressed data express difference with the expanding data which data decompression was carried out and were obtained in said data decompression section -- this -- difference -- the data regenerative apparatus characterized by having the synthetic section which compounds data and said expanding data and reproduces said former data.

[Claim 15] the former data reproduced in said synthetic section of the data regenerative apparatus of the preceding paragraph by - [the 2nd step of] the

n-th step of data regenerative apparatus of said data regenerative apparatus connected to the serial n steps -- difference -- the data regenerative apparatus according to claim 14 characterized by being inputted as data.

[Claim 16] said difference which is the 1st step of data regenerative apparatus of said data regenerative apparatus connected to the serial n steps, and is inputted from the exterior -- the time of data being the compressed data by which the data compression was carried out -- said synthetic section -- setting -- said difference -- the data regenerative apparatus according to claim 15 characterized by compounding with said expanding data after carrying out data decompression of the data.

[Claim 17] The data recorder characterized by what said 1st inputted data is changed into said 2nd data based on the data generation method of claim 1 - claim 7, and is recorded on a record medium.

[Claim 18] the compressed data which changes said 1st inputted data into said 2nd data based on the data generation method of claim 1 - claim 7, and is generated from said 1st data, and said difference -- the data recorder characterized by recording data on the record medium of another object, respectively.

[Claim 19] the compressed data which changes said 1st inputted data into said 2nd data based on the data generation method of claim 5 - claim 7, and is generated from said 1st data, and said n difference -- the data recorder characterized by recording data on the record medium of another object, respectively.

[Claim 20] The data compression section which carries out the data compression of the data inputted from the exterior by the predetermined lossy compression method, and generates compressed data, The write-in control section which writes the compressed data generated in this data compression circuit in a record medium, The data decompression section which carries out data decompression of the compressed data generated in said data compression circuit by said lossy compression method, and generates expanding data, the difference showing the difference of the data inputted from the exterior, and said expanding data -- the difference which generates data and is outputted outside -- the data recorder characterized by having the data generation section.

[Claim 21] said difference outputted outside -- the data recorder according to claim 20 characterized by recording data on an outboard recorder.

[Claim 22] the time of being the 2-n-th step of data recorder of said data

recorders connected to the serial n steps -- said difference of the data recorder of the preceding paragraph -- the difference generated in the data generation section -- the data recorder according to claim 21 characterized by inputting data into said data compression section.

[Claim 23] the time of being the data recorder of eye the last stage of said data recorders connected to the serial n steps -- said difference -- the difference generated in the data generation section -- the data recorder according to claim 22 characterized by carrying out the data compression of the data further, and outputting outside.

[Claim 24] said difference outputted outside from the data recorder of eye the last stage of said data recorders connected to the serial n steps -- the data recorder according to claim 22 or 23 characterized by recording data on an outboard recorder.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention is a thing about the data generation method, data recorder, and data regenerative apparatus for performing record playback of a data signal by which the data compression was carried out. Especially ATRAC (Adaptive Transform Acoustic Coding), ATRAC3 (Adaptive Transform Acoustic Coding 3), AAC (Advanced Audio Coding), TwinVQ (Transform-domain Weighted INterleave Vector Quantization), It is related with

the data generation method, data recorder, and data regenerative apparatus for performing record playback of a data signal by which the data compression was carried out using lossy compression methods, such as MP3 (MPEG1 Audio Layer 3).

[0002]

[Description of the Prior Art] In recent years, in audio data etc., the technique which uses and carries out the data compression of various audio low bit rate coding methods, such as ATRAC, ATRAC3, AAC and TwinVQ, and MP3, for the formation of small lightweight of the record medium or improvement in the speed of data distribution is offered. The data-logging regenerative apparatus which performs record playback of the mini disc (a "disk" is only called hereafter.) which is a magneto-optic disk with which the audio data by which the data compression was carried out, using an ATRAC method as a representative of the data-logging regenerative apparatus which carries out record playback of the audio data by which the data compression was carried out using such an audio low bit rate coding method at a record medium are recorded is explained below.

[0003] The configuration of the conventional data-logging regenerative apparatus is shown in drawing 13 . The data-logging regenerative apparatus of

drawing 13 performs record or playback of data on a disk 13 by irradiating laser light from an optical pickup 1 to a disk 13 through objective lens 1a. Objective lens 1a is controlled by the actuator in this optical pickup 1 (un-illustrating) to move in the direction of a path of a disk 13. And an optical pickup 1 is moved in the direction of a path of a disk 13 (it is the rectangular direction to a truck) by the delivery motor 8. Moreover, a disk 13 rotates to a hoop direction with a spindle motor 9.

[0004] Thus, the laser light by which outgoing radiation is carried out from an optical pickup 1 is followed on a target truck in an optical pickup 1, the delivery motor 8, and a spindle motor 9 operating. At this time, actuation of an optical pickup 1, the delivery motor 8, and a spindle motor 9 is controlled by supplying power from the drive circuit 10.

[0005] That is, incidence of the laser light reflected from a disk 13 is carried out to an optical pickup 1, and various signals, such as a data signal, a tracking error signal, and a synchronizing signal, are outputted from an optical pickup 1. And the signal outputted from an optical pickup 1 is amplified by RF amplifier 2, and is given to the servo circuit 11. According to directions of system controller 12a, based on the signal amplified by RF amplifier 2, the servo circuit 11 determines

the controlled variable in the drive circuit 10, and gives it to the drive circuit 10 as a control signal.

[0006] And at the time of record actuation, if the sound signal of an analog signal is changed into a digital signal by A/D converter 7a, with an ATRAC method, a data compression will be carried out by data compression circuit 6c, the compressed data of the rate of per second 0.3 Mbit will be generated, and it will be sent out to the memory controller 4. The memory controller 4 is controlling writing and read-out of the shock proof memory 5 according to directions of system controller 12a, and it sends out the compressed data read from the shock proof memory 5 to an encoder / decoder / digital disposal circuit 3 while it writes the compressed data from data compression circuit 6c in the shock proof memory 5, so that compressed data may be made to hold in the shock proof memory 5.

[0007] An encoder / decoder / digital disposal circuit 3 generates a sub-code from each information given from system controller 12a, such as a tune number number and elapsed time. Moreover, after an encoder / decoder / digital disposal circuit 3 performs and encodes signal processing, such as error detecting code addition, to the compressed data given from the memory controller 4, it becomes

irregular to a RF signal and it is sent out to RF amplifier 2. The high frequency signal amplified by this RF amplifier 2 is given to an optical pickup 1, and record of the data to a disk 13 is performed based on this high frequency signal. While making the magnetic head (un-illustrating) contact the truck location where an optical pickup 1 is recorded at this time, data are made to record on a disk 13 by irradiating laser light through objective lens 1a.

[0008] Moreover, at the time of playback actuation, if the laser light which irradiated the truck of a disk 13 through objective lens 1a reflects the truck of a disk 13 and ON light is carried out to an optical pickup 1, the data which serve as a high frequency signal based on the deviation direction of the laser light by which ON light was carried out will be read at the rate of per second 1.4 Mbit. The read high frequency signal is decoded, after being amplified by RF amplifier 2 and getting over by the encoder / decoder / digital disposal circuit 3. At this time, a sub-code is sent out to system controller 12a, and each information, such as a tune number number and elapsed time, is recognized from a sub-code.

[0009] Moreover, in order to decode to the compressed data of a basis, signal processing, such as error correction processing, is performed by the encoder / decoder / digital disposal circuit 3. And the compressed data which was decoded

by the encoder / decoder / digital disposal circuit 3, and was obtained is sent out to the memory controller 4. The memory controller 4 is controlling writing and read-out of the shock proof memory 5 according to directions of system controller 12a, and it sends out the compressed data read from the shock proof memory 5 to 6d of data growth long-gyrus-of-insula ways while it writes the compressed data from an encoder / decoder / digital disposal circuit 3 in the shock proof memory 5, so that compressed data may be made to hold in the shock proof memory 5.

[0010] Thus, in the memory controller 4 operating, while absorbing the difference of the transfer rate of the compressed data sent out from an encoder / decoder / digital disposal circuit 3, and the transfer rate of the compressed data sent out to 6d of data growth long-gyrus-of-insula ways, in order to prevent interruption of playback by disturbance, such as vibration, a sound signal output can be protected. And on 6d of data growth long-gyrus-of-insula ways, data decompression of the compressed data compressed by the ATRAC method is carried out to the digital signal of the original magnitude. At this time, data decompression is performed at the rate of per second 0.3 Mbit on 6d of data growth long-gyrus-of-insula ways. The digital signal which data decompression

was carried out and was acquired is changed into the sound signal which is an analog signal in D/A converter 7b, and voice will be reproduced by the loudspeaker etc. if outputted.

[0011]

[Problem(s) to be Solved by the Invention] In a data-logging regenerative apparatus like above-mentioned drawing 13 , data compression circuit 6c is constituted like the data compression circuit 61 of drawing 2 . Therefore, the digital signal given from A/D converter 7a is first divided into the signal of three bands of low-pass (DC-5.5kHz), a mid-range (5.5kHz - 11kHz), and a high region (11kHz - 22kHz) by the band division filter 6-1. And by time amount / frequency shaft conversion circuit 6-2, MDCT (Modified Discrete Cosine Transform) is given and it is changed into frequency spectrum data. Weighting of the bit length which this frequency spectrum data united with human being's acoustic-sense psychology in bit allocation / quantization circuit 6-3 is performed, and it is sent out to the memory controller 4. At this time, to a frequency sensitive to human being's lug, many numbers of bits are assigned and the small number of bits is conversely assigned to an insensible frequency.

[0012] Moreover, 6d of data growth long-gyrus-of-insula ways is constituted like

the data growth long-gyrus-of-insula way 62 of drawing 3 . Therefore, the compressed data sent out from the memory controller 4 is first changed into frequency spectrum data from the WORD length in compressed data, a scale factor, and audio spectrum data by the reverse quantization circuit 6-4. And by the frequency / time-axis conversion circuit 6-5, IMDCT (Inverse Modified DiscreteCosine Transform) is given and the time-axis signal of low-pass, a mid-range, and three bands of a high region is generated. By the time-axis signal of these three bands being compounded with the band composition filter 6-6, a digital signal is generated and it is sent out to D/A converter 7b.

[0013] Thus, in case the data-logging regenerative apparatus which performs record playback of a mini disc records the data compressed into one fifth on a mini disc and is reproduced with an ATRAC method, although this compressed data is elongated and it reproduces, since this compression method is lossy compression, the elongated data do not necessarily return to the original data. Moreover, although ATRAC3, MP3, etc. have spread in order to realize further high-pressure shrinkage, tone quality will deteriorate compared with the original sound. However, if compressibility is low, since fault will arise in a transmission rate, network regenerative-apparatus capacity, and network operating state, a

noise and a sound piece may be raised.

[0014] This invention aims at offering the data generation method, data recorder, and data regenerative apparatus which generate data other than the data compressed with the data compressed at the time of data logging in view of such a problem.

[0015]

[Means for Solving the Problem] the difference which expresses the difference of the compressed data with which the data generation method of this invention carried out the data compression of the 1st data according to the predetermined lossy compression method, and the expanding data which carried out data decompression of this compressed data according to said lossy compression method and the original input data in order to attain the above-mentioned purpose -- data -- generating -- said compressed data and said difference -- it is characterized by to generate the 2nd data which compounded data.

[0016] such compressed data and difference -- the difference in case the 2nd data generated by data is reproduced, after carrying out data decompression of the compressed data -- an error with the 1st data of the origin produced when data decompression of the compressed data is carried out by adding the

difference expressed by data -- difference -- it can compensate by data and the data near the 1st original data can be reproduced.

[0017] such a data generation method -- setting -- said difference -- data are not cared about as compressed data by which the data compression was carried out. moreover, said difference -- data are not cared about with the lossy compression method more nearly same than said 1st data as the compression method for generating compressed data as compressed data by which the data compression was carried out.

[0018] furthermore, said difference -- using data as the compressed data by which the data compression was carried out by the lossless compression method -- this difference -- when data decompression of the data is carried out, the difference of the value as the difference of the expanding data which carried out data decompression of the compressed data by which the data compression was carried out, and obtained it, and the 1st original data with the 1st almost same data is obtained. therefore, this difference -- the difference which carried out data decompression of the data and obtained them is reproducible as the almost same data as the 1st original data by adding to expanding data.

[0019] moreover, the difference generated from said 1st data -- the difference

generated in order [data], after carrying out the data compression of the data the expanding data which carried out data decompression again, and the original difference -- the difference showing difference with data -- the difference which generates data -- data generation actuation -- n (n) the difference generated from the compressed data generated from zero or more integer time repeats and said 1st data, and said 1st data -- data and said difference -- n difference which repeated data generation actuation n times and was generated -- data are compounded and you may make it generate the 2nd data

[0020] thus, the thing to do -- difference -- the difference by which the data compression was carried out while performing the data compression of data and decreasing the amount of data of the 2nd data -- the expanding data which carried out data decompression of the data, and the original difference -- the difference showing difference with data -- data are generated further. therefore, this difference by which the data compression was carried out -- the time of reproducing data -- the original difference -- data -- the difference of a near value -- it is reproducible to data.

[0021] furthermore, such a data generation method -- setting -- said difference -- data are not cared about with the lossy compression method more nearly same

than said 1st data as the compression method for generating compressed data as compressed data by which the data compression was carried out. furthermore, said n-th difference -- the difference generated in data generation actuation -- data are not cared about with a lossless compression method as compressed data by which the data compression was carried out.

[0022] the 2nd data generated with the above-mentioned data generation method inputs the data regenerative apparatus of this invention -- having -- this 2nd data -- said difference -- the expanding data which carried out data decompression of the compressed data which separated data and the compressed data generated from said 1st data, and was generated from said 1st data -- said difference -- it is characterized by to generate said 1st data and to reproduce by adding the difference obtained from data.

[0023] moreover, said 2nd data inputted -- said difference -- the expanding data which carried out data decompression of the compressed data which separated data and the compressed data generated from said 1st data, and was generated from said 1st data -- said n difference -- it is characterized by generating said 1st data and reproducing by adding the difference obtained from data.

[0024] this time -- difference -- when data are compressed data, the 1st data is

reproduced by being added to the expanding data with which the difference obtained by carrying out data decompression carried out data decompression of the compressed data generated from the 1st data.

[0025] Moreover, the read-out control section which reads the compressed data with which the data regenerative apparatus of this invention was stored in the record medium, The data decompression section which carries out data decompression of the compressed data read by the read-out control section by the predetermined lossy compression method, the difference to which the former data of said compressed data stored in said record medium and said compressed data express difference with the expanding data which data decompression was carried out and were obtained in said data decompression section -- data input from the exterior -- having -- this -- difference -- with the synthetic section which compounds data and said expanding data and reproduces said former data It is characterized by ****(ing).

[0026] the difference recorded on the outboard recorder when such one data regenerative apparatus was used -- data may be made to be inputted into the synthetic section. moreover, this time -- difference -- even if data are not inputted, at least the compressed data based on the 1st data is reproducible as usual.

[0027] furthermore, the difference outputted to compressed data from the data regenerative apparatus of the preceding paragraph from the record medium reproduced with each data regenerative apparatus when connecting two or more such data regenerative apparatus to a serial -- data -- in addition, difference -- it outputs to the data regenerative apparatus connected to the latter part as data. By doing in this way, the data of the value near the 1st original data are reproduced and outputted from the data regenerative apparatus of the last stage.

[0028] The data recorder of this invention is characterized by what said 1st inputted data is changed into said 2nd data based on the data generation method mentioned above, and is recorded on a record medium. moreover, the compressed data which changes said 1st inputted data into said 2nd data based on the data generation method mentioned above, and is generated from said 1st data and said difference -- it is characterized by recording data on the record medium of another object, respectively.

[0029] Moreover, the data compression section which the data recorder of this invention carries out the data compression of the data inputted from the exterior by the predetermined lossy compression method, and generates compressed data, The write-in control section which writes the compressed data generated in

this data compression circuit in a record medium, The data decompression section which carries out data decompression of the compressed data generated in said data compression circuit by said lossy compression method, and generates expanding data, the difference showing the difference of the data inputted from the exterior, and said expanding data -- the difference which generates data and is outputted outside -- it is characterized by having the data generation section.

[0030] the difference outputted outside when such one data recorder is used -- you may make it record data on an outboard recorder At this time, the compressed data recorded on a record medium by the data recorder is reproducible with the conventional data regenerative apparatus.

[0031] furthermore, the difference outputted from each data recorder after the 2nd step when connecting two or more such data regenerative apparatus to a serial -- the expanding data with which data decompression of this compressed data was carried out while the compressed data with which the data compression of the data was carried out was recorded on the record medium, and the original difference -- the difference showing difference with data -- data are generated and it outputs to the data recorder connected to the latter part.

[0032]

[Embodiment of the Invention] The gestalt of operation of this invention is explained below.

[0033] <the generation method of compressed data> -- the generation method of compressed data is explained first. First, the data compression of the digital signal S0 which the sound signal was quantized and was acquired is carried out by lossy compression methods, such as an ATRAC method. And data decompression of the compressed data c0 which it was compressed and was obtained is carried out again. Since compressed data c0 is compressed by the lossy compression method at this time, the digital signal s0 which developed and was acquired is a different signal although it is similar with the original digital signal S0. And the difference (S0-s0) of this digital signal s0 and the original digital signal S0 is calculated, and a differential signal S1 is generated.

[0034] Next, the data compression of this differential signal S1 is carried out by the lossy compression method like a digital signal S0, and compressed data c1 is generated. And data decompression of this compressed data c1 is carried out again, a differential signal s1 is generated, the difference (S1-s1) of this differential signal s1 and the original differential signal S1 is calculated, and a

differential signal S2 is generated. If such actuation is repeated n times and a differential signal Sn is generated, the data compression of this differential signal Sn will be carried out, and compressed data cx will be generated. In addition, the compression method used in case the data compression of this differential signal Sn is carried out is not cared about as the same compression method as the compression method used in case the data compression of a digital signal S0 and differential signal S1-Sn-1 is carried out, and is not cared about as a different compression method.

[0035] And the compressed data group C by which compressed data c0-cn-1 and compressed data cx were compounded is expressed as compressed data which carried out the data compression of the original sound signal. That is, when data decompression of the compressed data group C is carried out, data decompression of compressed data c0-cn-1 and compressed data cx which constitute the compressed data group C is carried out, respectively, and a digital signal s0 and differential signals s1-sn are acquired. Therefore, the digital signal near the original digital signal S0 can be acquired by adding a digital signal s0 and differential signals s1-sn.

[0036] Moreover, when data decompression of the compressed data cx is

carried out by making into a lossless compression method the compression method used in case the data compression of the differential signal Sn is carried out, a differential signal Sn can be acquired. Therefore, since it can bring close to the original digital signal S0 further by adding the digital signal s0, differential signal s1-sn-1, and the differential signal Sn which carried out data decompression of the compressed data group C, and obtained it, when it reproduces as a sound signal, it can consider as the almost same tone quality as a fundamental tone.

[0037] The generation method of the compressed data in this invention records the compressed data of a digital signal and two or more differential signals on each of two or more disks and outboard recorders in the data-logging regenerative apparatus explained below on the basis of an above-mentioned approach, and the compressed data generated by the above-mentioned data compression approach is distributed through a communication network by the playback approach of the sound signal distributed as audio data.

[0038] The data-logging regenerative apparatus which used the mini disc for <record playback to a record medium>, next the record medium which records data is mentioned as an example, and is explained. The optical pickup 1 which

the data-logging regenerative apparatus of drawing 1 irradiates laser light through objective lens 1a at a disk 13, and performs record or playback of data, RF amplifier 2 which amplifies a high frequency signal, and the encoder / decoder / digital disposal circuit 3 which performs encoding or decoding of compressed data, The memory controller 4 which performs read-out and write-in control of the shock proof memory 5, The shock proof memory 5 in which compressed data is written, and data compression circuit 6a which carries out the data compression of the digital signal, It has data growth long-gyrus-of-insula way 6b which carries out data decompression of the compressed data to a digital signal, A/D converter 7a which changes a sound signal into a digital signal, and D/A converter 7b which changes a digital signal into a sound signal.

[0039] Moreover, the conventional data-logging regenerative apparatus and the delivery motor 8 made to move an optical pickup 1 in the direction of a path of a disk 13 similarly, The drive circuit 10 which controls actuation of the actuator in the spindle motor 9 made to rotate a disk 13, the delivery motor 8 and a spindle motor 9, and an optical pickup 1 (drawing 1), It has the servo circuit 11 which determines the controlled variable in the drive circuit 10 based on the signal amplified by RF amplifier 2, an encoder / decoder / digital disposal circuit 3, the

memory controller 4 and the servo circuit 11, and the system controller 12 which performs an exchange of a signal.

[0040] furthermore, difference -- with the delay circuit 14 which a digital signal is delayed and gives it to the generation circuit 15 the difference which generates the differential signal showing the difference of the digital signal elongated by data growth long-gyrus-of-insula way 6b, and the original digital signal -- with the generation circuit 15 The data compression circuit 16 which performs the data compression of a differential signal, and the selector circuit 17 which chooses the digital signal given from each of data growth long-gyrus-of-insula way 6b and the synthetic circuit 18, The synthetic circuit 18 which performs addition of the digital signal and differential signal which are given from the data growth long-gyrus-of-insula way 15, The delay circuit 19 which a differential signal is delayed and gives it to the synthetic circuit 18, and the data growth long-gyrus-of-insula way 20 which carries out data decompression and generates a differential signal, It has the input device 21 for a user to operate actuation of a data-logging regenerative apparatus, the indicating equipment 22 which displays the actuation information on the operating state of a data-logging regenerative apparatus, or an input device 21, and switches SW1-SW6.

[0041] In such a data-logging regenerative apparatus, an optical pickup 1, RF amplifier 2, the encoder / decoder / digital disposal circuit 3, the memory controller 4, the shock proof memory 5, the delivery motor 8, a spindle motor 9, the drive circuit 10, and the servo circuit 11 perform the respectively same actuation as the conventional data-logging regenerative apparatus shown in drawing 13 . Therefore, it omits about detailed explanation of the actuation.

[0042] First, record actuation of the data-logging regenerative apparatus of such a configuration is explained below. the difference after data decompression of the compressed data from data compression circuit 6a was given and carried out to data growth long-gyrus-of-insula way 6b by connecting the contact a of switches SW1 and SW2 like drawing 4 -- it is made for the generation circuit 15 to be given And the sound signal from the outside is inputted into A/D converter 7a by connecting the contact a of a switch SW3. moreover, the thing for which the contact a of a switch SW4 is connected -- difference -- it is made to output outside the differential signal generated in the generation circuit 15

[0043] If a sound signal is changed into a digital signal by A/D converter 7a at this time, data compression circuit 6a and the delay circuit 14 will be given. And in data compression circuit 6a, as usual, the data compression of an ATRAC

method is performed and compressed data is generated. That is, the digital signal given from A/D converter 7a is first divided into the signal of low-pass, a mid-range, and three bands of a high region by the band division filter 6-1 like the data compression circuit 61 of drawing 2 , and by time amount / frequency shaft conversion circuit 6-2, MDCT is given and it is changed into frequency spectrum data. And weighting of the bit length which this frequency spectrum data united with human being's acoustic-sense psychology in bit allocation / quantization circuit 6-3 is performed, and it is sent out to the memory controller 4.

[0044] The compressed data from data compression circuit 6a is given to the memory controller 4 and data growth long-gyrus-of-insula way 6b. and data decompression of the compressed data given to data growth long-gyrus-of-insula way 6b is carried out, and it is made into a digital signal -- having -- difference -- it is sent out to the generation circuit 15. difference -- in the generation circuit 15, the difference of the digital signal from A/D converter7a delayed in the delay circuit 14 and the digital signal by which data decompression was carried out by data growth long-gyrus-of-insula way 6b is called for, and it outputs as a differential signal. This differential signal is outputted outside through a switch SW4. At this time, the delay circuit 14

doubles in the timing of the digital signal from A/D converter7a, and the digital signal by which data decompression was carried out by data growth long-gyrus-of-insula way 6b.

[0045] Moreover, an optical pickup 1, RF amplifier 2, the encoder / decoder / digital disposal circuit 3, the memory controller 4, the shock proof memory 5, the delivery motor 8, a spindle motor 9, the drive circuit 10, and the servo circuit 11 are operating like the conventional data-logging regenerative apparatus, and the compressed data given to the memory controller 4 is recorded on a disk 13.

[0046] Moreover, the data-logging regenerative apparatus into which the differential signal outputted from the data-logging regenerative apparatus of the preceding paragraph is inputted becomes like drawing 5 in the connection relation of switches SW1-SW4. That is, like drawing 4 , while the contact a of switches SW1, SW2, and SW4 is connected, the contact b of a switch SW3 is connected. Therefore, a differential signal is sent out to data compression circuit 6a and the delay circuit 14 through a switch SW3. and the difference of the differential signal by which data decompression was carried out by data growth long-gyrus-of-insula way 6b while the data compression of the differential signal was carried out by data compression circuit 6a and it was recorded on the disk

13, and the original differential signal -- difference -- it asks in the generation circuit 15 and is outputted outside through a switch SW4 as a differential signal.

[0047] Therefore, by four data-logging regenerative-apparatus A-D, in case a sound signal is recorded, it connects in serial like drawing 6 . At this time, the data-logging regenerative apparatus A to which switches SW1-SW4 were connected like drawing 4 is made into the 1st step, and data-logging regenerative-apparatus B-D to which switches SW1-SW4 were connected like drawing 5 is made into the 2-4th step. therefore -- while a sound signal is inputted into the 1st step of data-logging regenerative apparatus A, and a sound signal is compressed and being recorded on record-medium 13a -- difference -- the differential signal generated in the generation circuit 15 is inputted into the 2nd step of data-logging regenerative apparatus B.

[0048] next -- while the data compression of the differential signal generated with the 1st step of data-logging regenerative apparatus A is carried out and it is recorded on record-medium 13b in the 2nd step of data-logging regenerative apparatus B -- difference -- the differential signal generated in the generation circuit 15 is inputted into the 3rd step of data-logging regenerative apparatus C. next -- while the data compression of the differential signal generated with the

2nd step of data-logging regenerative apparatus B is carried out and it is recorded on record-medium 13c in the 3rd step of data-logging regenerative apparatus C -- difference -- the differential signal generated in the generation circuit 15 is inputted into the 4th step of data-logging regenerative apparatus D. Finally, in the 4th step of data-logging regenerative apparatus D, the data compression of the differential signal generated with the 3rd step of data-logging regenerative apparatus C is carried out, and it is recorded on 13d of record media.

[0049] Therefore, the data compression of the error component with the sound signal which data decompression of the data with which the data compression of the sound signal was carried out by the ATRAC method, it was recorded on disk 13a of the 1st sheet, and was recorded on the original sound signal and disk 13a was carried out, and was acquired is carried out, and it is recorded on disk 13b of the 2nd sheet. Moreover, the data compression of the error component of the differential signal which data decompression of the data with which the data compression of the error component of the differential signal which data decompression of the data recorded on disk 13b was carried out, and was acquired, and the original differential signal was carried out, it was recorded on

disk 13c of the 3rd sheet, and was recorded on disk 13c was carried out, and was acquired, and the original differential signal is carried out, and it is recorded on disk 13d of the 4th sheet.

[0050] Furthermore, when making into one set the data-logging regenerative apparatus which records data on a disk and outputting a differential signal to outboard recorders, such as a hard disk, the connection relation of switches SW1-SW4 becomes like drawing 7 . That is, like drawing 4 , while the contact a of switches SW1, SW2, and SW3 is connected, the contact b of a switch SW4 is connected. Therefore, the sound signal changed into the digital signal by A/D converter 7a is sent out to data compression circuit 6a and the delay circuit 14. and the difference of the digital signal by which data decompression was carried out by data growth long-gyrus-of-insula way 6b while the data compression of the digital signal was carried out by data compression circuit 6a and it was recorded on the disk 13, and the original digital signal -- difference -- it asks in the generation circuit 15 and is sent out to the data compression circuit 16 as a differential signal.

[0051] In the data compression circuit 16, after carrying out the data compression of the differential signal, it outputs to an outboard recorder 23.

Therefore, while the compressed data of a sound signal is recorded on a disk 13, the compressed data of a differential signal is recorded on an outboard recorder 23. The data compression in this data compression circuit 16 may be performed using the ATRAC method which is the same compression method as data compression circuit 6a, and other compression methods may be used for it. Furthermore, a data compression may be made to be carried out using a lossless compression method.

[0052] Moreover, the compressibility in the data compression circuit 16 is set up with the bit rate inputted by the input device 21 in a system controller 12. In addition, the data compression circuit 16 is good as what became independent of data compression circuit 6a, and data compression circuit 6a, a part, or the whole does not matter as what consists of common circuits.

[0053] Next, playback actuation of the data-logging regenerative apparatus of the configuration of drawing 1 is explained below. After data decompression of the compressed data from the memory controller 4 is given and carried out to data growth long-gyrus-of-insula way 6b by connecting the contact b of switches SW1 and SW2 like drawing 8 , it is made for a selector circuit 17 and the synthetic circuit 18 to be given. And the differential signal chosen in the selector

circuit 17 is outputted outside by connecting the contact b of a switch SW5.

[0054] When the digital signal which data decompression was carried out and was acquired by data growth long-gyrus-of-insula way 6b in the selector circuit 17 is chosen as a differential signal, any of Contacts a and b are sufficient as connection of a switch SW6. Therefore, in an optical pickup 1, RF amplifier 2, the encoder / decoder / digital disposal circuit 3, the memory controller 4, the shock proof memory 5, the delivery motor 8, a spindle motor 9, the drive circuit 10, and the servo circuit 11 operating like the conventional data-logging regenerative apparatus, in data growth long-gyrus-of-insula way 6b, data decompression of an ATRAC method is given for the compressed data read from the disk 13, and a digital signal is generated.

[0055] That is, the compressed data sent out from the memory controller 4 is first changed into frequency spectrum data by the reverse quantization circuit 6-4 like the data growth long-gyrus-of-insula way 62 of drawing 3 . And by the frequency / time-axis conversion circuit 6-5, IMDCT is given and the time-axis signal of low-pass, a mid-range, and three bands of a high region is generated. A digital signal is generated by the time-axis signal of these three bands being compounded with the band composition filter 6-6. If the digital signal generated

by this data growth long-gyrus-of-insula way 6b is chosen in a selector circuit 17, it will be outputted as a differential signal through a switch SW5.

[0056] In a selector circuit 17, when the digital signal from the synthetic circuit 18 is chosen, the contact a of a switch SW6 is connected like drawing 8 . Therefore, if the compressed data read from the disk 13 is sent out from the memory controller 4, in data growth long-gyrus-of-insula way 6b, data decompression of an ATRAC method will be given and a digital signal will be generated. And the differential signal outputted from the data-logging regenerative apparatus of the preceding paragraph is sent out to the delay circuit 19 through a switch SW6.

[0057] In the synthetic circuit 18, the differential signal from the delay circuit 19 is added to a digital signal from data growth long-gyrus-of-insula way 6b, and the original differential signal is generated. After this differential signal is chosen in a selector circuit 17, it is outputted outside through a switch SW5. At this time, timing with the digital signal by which data decompression was carried out to the differential signal given through a switch SW6 from the exterior by data growth long-gyrus-of-insula way 6b in the delay circuit 16 doubles.

[0058] Moreover, the data-logging regenerative apparatus which outputs a sound signal while the differential signal outputted from the data-logging

regenerative apparatus of the preceding paragraph is inputted becomes like drawing 9 in the connection relation of switches SW1, SW2, SW5, and SW6. That is, like drawing 8 , while the contact b of switches SW1 and SW2 is connected, the contact a of a switch SW6 is connected, and the contact a of a switch SW5 is connected. Therefore, a differential signal is sent out to the delay circuit 19 through a switch SW6. And the differential signal from the delay circuit 19 is added to a digital signal from data growth long-gyrus-of-insula way 6b, and the original digital signal is generated in the synthetic circuit 18. After this digital signal is chosen in a selector circuit 17, it is sent out to D/A converter 7b through a switch SW5, is changed into the sound signal which is an analog signal, and is outputted outside.

[0059] Therefore, by four data-logging regenerative-apparatus A-D, in case a sound signal is reproduced, it connects in serial like drawing 10 . At this time, data-logging regenerative-apparatus D-B to which switches SW1, SW2, SW5, and SW6 were connected like drawing 8 is made into the 1-3rd step, and the data-logging regenerative apparatus A to which switches SW1, SW2, SW5, and SW6 were connected like drawing 9 is made into the 4th step. Moreover, while the data-logging regenerative apparatus D chooses the digital signal from data

growth long-gyrus-of-insula way 6b in a selector circuit 19, data-logging regenerative-apparatus A-C chooses the digital signal from the synthetic circuit 18 in a selector circuit 19.

[0060] Therefore, if the compressed data read from disk 13d is elongated with the 1st step of data-logging regenerative apparatus D and a differential signal is generated, this differential signal will be inputted into the 2nd step of data-logging regenerative apparatus C. In the 2nd step of data-logging regenerative apparatus C, after elongating the compressed data read from disk 13c, the differential signal given from the 1st step of data-logging regenerative apparatus D is added, a differential signal is generated, and the 3rd step of data-logging regenerative apparatus B is given.

[0061] In the 3rd step of data-logging regenerative apparatus B, after elongating the compressed data read from disk 13b, the differential signal given from the 2nd step of data-logging regenerative apparatus C is added, a differential signal is generated, and the 4th step of data-logging regenerative apparatus A is given. In the 4th step of data-logging regenerative apparatus A, after adding the differential signal given from the 3rd step of data-logging regenerative apparatus B after elongating the compressed data read from disk 13a and generating a

digital signal, it changes and outputs to the sound signal which is an analog signal.

[0062] Furthermore, while playing the disk of one sheet, when the compressed data of a differential signal is inputted from outboard recorders, such as a hard disk, the connection relation of switches SW1, SW2, SW5, and SW6 becomes like drawing 11 . That is, like drawing 9 , while the contact b of switches SW1 and SW2 is connected, the contact a of a switch SW5 is connected, and the contact b of a switch SW6 is connected. Therefore, after data decompression of the compressed data of a differential signal inputted from an outboard recorder 23 is carried out on the data growth long-gyrus-of-insula way 20, it is sent out to the delay circuit 19 through a switch SW6. And the differential signal from the delay circuit 19 is added to a digital signal from data growth long-gyrus-of-insula way 6b, and the original digital signal is generated in the synthetic circuit 18. After this digital signal is chosen in a selector circuit 17, it is sent out to D/A converter 7b through a switch SW5, is changed into the sound signal which is an analog signal, and is outputted outside.

[0063] In addition, the data growth long-gyrus-of-insula way 20 is good as what became independent of data growth long-gyrus-of-insula way 6b, and data

growth long-gyrus-of-insula way 6b, a part, or the whole does not matter as what consists of common circuits. Moreover, like the data compression circuit 16, the data compression in this data growth long-gyrus-of-insula way 20 may be performed using the ATRAC method which is the same compression method as data growth long-gyrus-of-insula way 6b, and other compression methods may be used for it. Furthermore, a data compression may be made to be carried out using a lossless compression method.

[0064] Moreover, in case two or more data-logging regenerative apparatus are connected to a serial and record actuation is made to perform, the data compression of the differential signal generated with the data-logging regenerative apparatus of the last stage is carried out in the data compression circuit 16, and you may make it recorded on an outboard recorder 23. When the compression method in the data compression circuit 16 considers as a lossless compression method at this time, in case it connects the data-logging regenerative apparatus of the same number to a serial and playback actuation is made to perform, when data decompression of the compressed data of the differential signal recorded on the outboard recorder 23 is carried out on the data growth long-gyrus-of-insula way 20 of the 1st step of data-logging regenerative

apparatus, it can be returned to the original differential signal. Therefore, since such a differential signal is generable with the 1st step of data-logging regenerative apparatus, the sound signal outputted from the data-logging regenerative apparatus of the last stage can consider as the sound signal of the almost same tone quality as a fundamental tone.

[0065] Furthermore, when using the data-logging regenerative apparatus A of drawing 10 at the time of playback, even if it separates and uses connection with an outboard recorder 23, since the compressed data recorded in disk 13a is the same as the compressed data recorded with the conventional data-logging regenerative apparatus, the sound signal of the same tone quality as the former is compensated. Moreover, the compressed data recorded on disk 13a can also reproduce the conventional data regenerative apparatus.

[0066] The data regenerative apparatus which reproduces the <playback approach of the data distributed from a communication network>, next the data distributed through a communication network is mentioned as an example, and is explained.

[0067] The transceiver circuit 101 which gives a strange recovery while the data regenerative apparatus shown in drawing 12 transmits and receives data

through a communication network, The decoder 102 which decodes the signal given from the transceiver circuit 101, The memory controller 103 which performs the writing and read-out control of memory 104, The memory 104 in which the compressed data which it was decoded by the decoder 102 and obtained is written by the memory controller 103, The data growth long-gyrus-of-insula way 105 which carries out data decompression of the compressed data read by the memory controller 103, The memory controller 106 which performs the writing and read-out control of memory 107, The memory 107 in which the digital signal and differential signal which data decompression was carried out and were acquired on the data growth long-gyrus-of-insula way 105 are written by the memory controller 106, The synthetic circuit 108 adding the digital signal and differential signal which were read from memory 107 by the memory controller 106, D/A converter 109 which changes the digital signal acquired in the synthetic circuit 108 into the sound signal which is an analog signal, It has the transceiver circuit 101, a decoder 102, the memory controller 103,106, and the synthetic circuit 108 and the system controller 110 which performs an exchange of a signal.

[0068] Actuation of the data regenerative apparatus of such a configuration is

explained. The audio data which consist of compressed data groups C generated with the compressed data generation method mentioned above by the music distribution server etc. are received through a communication network in the transceiver circuit 101. If the data in which the number of a compression method and a differential signal is shown are contained in a part for the header unit of this music signal and a part for this header unit is decoded by the decoder 102, it will be sent out to a system controller 110. Moreover, the transmission speed of the audio data transmitted through a communication network is recognized, and a system controller 110 is made to recognize the transmission speed in the transceiver circuit 101.

[0069] Moreover, if signal processing, such as error correction processing, is performed, a part for the Maine data division of audio data is decoded by the decoder 102 and the compressed data group C is obtained, the memory controller 103 will be given. The memory controller 103 is controlling writing and read-out of memory 104 according to directions of a system controller 110, and it sends out the compressed data group C read from memory 104 to the data growth long-gyrus-of-insula way 105 while it writes the compressed data group C from a decoder 102 in memory 104, so that the compressed data group C may

be made to hold in memory 104.

[0070] Compressed data c0-cn-1 which constitutes the compressed data group C, and cx are given to the data growth long-gyrus-of-insula way 105 in order [controller / 103 / memory]. And the compression method used when the data compression of compressed data c0-cn-1 and each cx was carried out is directed by the system controller 110, and data decompression is given according to this directed compression method. Thus, if data decompression of compressed data c0-cn-1 and each cx is carried out and a digital signal s0 and differential signals s1-sn are acquired, it will be sent out to the memory controller 106, respectively.

[0071] If the digital signal s0 and differential signals s1-sn with which data decompression of compressed data c0-cn-1 which constitutes the compressed data group C from a data growth long-gyrus-of-insula way 105, and the cx is carried out, and they are obtained are given to the memory controller 106 in order, it will write in memory 107 at the given order. And if sending out in the synthetic circuit 108 is directed from a system controller 110 while a differential signal sn is given to the memory controller 106, from memory 107, a digital signal s0 and differential signals s1-sn are read, and it sends out to the synthetic

circuit 108.

[0072] In the synthetic circuit 108, a digital signal s0 and differential signals s1-sn are added, and the digital signal used as the amount of data near the original digital signal S0 is generated. By D/A converter 109, this generated digital signal is changed into an analog signal, and is outputted as a sound signal.

[0073] Thus, the transmission rate which has recognized the data regenerative apparatus which can change the received audio data into a sound signal, and can be reproduced in operating in the transceiver circuit 101 transmits the signal for directing to reduce the number of the compressed data based on the differential signal which constitutes the compressed data group C in a music distribution server etc. through the transceiver circuit 101 and a communication network when it is judged that it is low with a system controller 110. Moreover, when the transmission rate recognized in the transceiver circuit 101 is conversely judged to be high with a system controller 110, the signal for directing to increase the number of the compressed data based on the differential signal which constitutes the compressed data group C in a music distribution server etc. through the transceiver circuit 101 and a communication network is transmitted.

[0074] That is, if n= 4, it directs to a music distribution server so that it divides a

transmission rate into five steps, and compressed data c0-c3 which the data compression of a digital signal S0 and a differential signal S1 - the S4 was carried out, and they obtained, and the compressed data group C which consists of cx(es) may be transmitted, when a transmission rate is the highest phase. Moreover, when it is in the phase where a transmission rate is high to the 2nd, it directs to a music distribution server so that the compressed data group C which consists of compressed data c0-c3 which the data compression of a digital signal S0 and the differential signals S1-S3 was carried out, and was obtained may be transmitted.

[0075] Moreover, when it is in the phase where a transmission rate is high to the 3rd, it directs to a music distribution server so that the compressed data group C which consists of compressed data c0-c2 which the data compression of a digital signal S0 and the differential signals S1 and S2 was carried out, and was obtained may be transmitted. Moreover, when it is in the phase where a transmission rate is high to the 4th, it directs to a music distribution server so that the compressed data group C which consists of compressed data c0 and c1 which the data compression of a digital signal S0 and the differential signal S1 was carried out, and was obtained may be transmitted. And when it is in the

phase where a transmission rate is the lowest, it directs to a music distribution server so that the compressed data group C which consists of compressed data c0 which the data compression of the digital signal S0 was carried out, and was obtained may be transmitted.

[0076] Therefore, the number of the compressed data which constitutes the compressed data group C in the audio data received from a system controller 110 according to the transmission rate of the audio data received in the transceiver circuit 101 is recognized. The number of this recognized compressed data is given to the memory controller 106 and the synthetic circuit 108, and each performs sending-out actuation to the synthetic circuit 108, and addition actuation according to the number of compressed data.

[0077] That is, if a transmission rate will be divided into five steps if n= 4, and it is sent out to coincidence in the synthetic circuit 108 once the digital signal s0 and differential signals s1-s4 which are acquired from the compressed data group C when a transmission rate is the highest phase are stored in memory 107, it will be added and will be sent out to D/A converter 109. Moreover, if the digital signal s0 and differential signals s1-s3 which are acquired from the compressed data group C are sent out to coincidence in the synthetic circuit 108 once they are

stored in memory 107 when it is the phase where a transmission rate is high to the 2nd, it will be added and will be sent out to D/A converter 109.

[0078] Moreover, if the digital signal s0 and differential signals s1 and s2 which are acquired from the compressed data group C are sent out to coincidence in the synthetic circuit 108 once they are stored in memory 107 when it is the phase where a transmission rate is high to the 3rd, it will be added and will be sent out to D/A converter 109. Moreover, if the digital signal s0 and differential signal s1 which are acquired from the compressed data group C are sent out to coincidence in the synthetic circuit 108 once they are stored in memory 107 when it is the phase where a transmission rate is high to the 4th, it will be added and will be sent out to D/A converter 109. And when it is the phase where a transmission rate is the lowest, if the digital signal s0 acquired from the compressed data group C is sent out to the synthetic circuit 108 once it is stored in memory 107, it will be sent out to D/A converter 109 as it is.

[0079] thus, close to the tone quality of a fundamental tone by increasing the number of the compressed data which constitutes the compressed-data group used as the Maine data of audio data, when the transmission rate of the audio data which prevent the sound piece by the lack of a transmission rate, and

receive by reducing the number of the compressed data which constitutes the compressed-data group used as the Maine data of audio data if the transmission rate of the audio data to receive is low is high -- high -- there can be a tone quality playback sound.

[0080]

[Effect of the Invention] according to this invention -- the 2nd data -- the compressed data of the 1st data, and difference -- it is constituted by two kinds of data of data. Therefore, for example, when priority is given to portability, a data regenerative apparatus can be made small by reproducing the record medium with which only the compressed data of the 1st data was recorded. moreover, the difference generated with the compressed data of the 1st data when a transmission rate was low -- it can consider as the data of amount of information according to reproduction speed by receiving the 2nd data which lessened data. on the contrary, the case where the quality of the data when reproducing is thought as important -- the compressed data of the 1st data, and difference -- the almost same quality data as the 1st original data are reproducible by reproducing the record medium with which data were recorded. moreover, the difference generated with the compressed data of the 1st data

when a transmission rate was high -- the almost same quality data as the 1st original data are reproducible by receiving the 2nd data which made [many] data.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The block diagram showing the internal configuration of the data-logging regenerative apparatus of this invention.

[Drawing 2] The block diagram showing the internal configuration of a data compression circuit.

[Drawing 3] The block diagram showing the internal configuration of a data growth long-gyrus-of-insula way.

[Drawing 4] The block diagram showing the connection relation at the time of data logging.

[Drawing 5] The block diagram showing the connection relation at the time of data logging.

[Drawing 6] Drawing showing the relation of the data-logging regenerative apparatus connected four steps at the time of data logging.

[Drawing 7] The block diagram showing the connection relation at the time of data logging.

[Drawing 8] The block diagram showing the connection relation at the time of data playback.

[Drawing 9] The block diagram showing the connection relation at the time of

data playback.

[Drawing 10] Drawing showing the relation of the data-logging regenerative apparatus connected four steps at the time of data playback.

[Drawing 11] The block diagram showing the connection relation at the time of data playback.

[Drawing 12] The block diagram showing the internal configuration of the data regenerative apparatus of this invention.

[Drawing 13] The block diagram showing the internal configuration of the conventional data-logging regenerative apparatus.

[Description of Notations]

1 Optical Pickup

2 RF Amplifier

3 Encoder / Decoder / Digital Disposal Circuit

4 Memory Controller

5 Shock Proof Memory

6a Data compression circuit

6b Data growth long-gyrus-of-insula way

7a A/D converter

7b D/A converter

8 Delivery Motor

9 Spindle Motor

10 Drive Circuit

11 Servo Circuit

12 System Controller

13 Disk

14 Delay Circuit

15 Difference -- Generation Circuit

16 Data Compression Circuit

17 Selector Circuit

18 Synthetic Circuit

19 Delay Circuit

20 Data Growth Long-Gyrus-of-Insula Way

21 Input Unit

22 Display